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Little Blackfoot River Natural Resources and Physical Features Inventory

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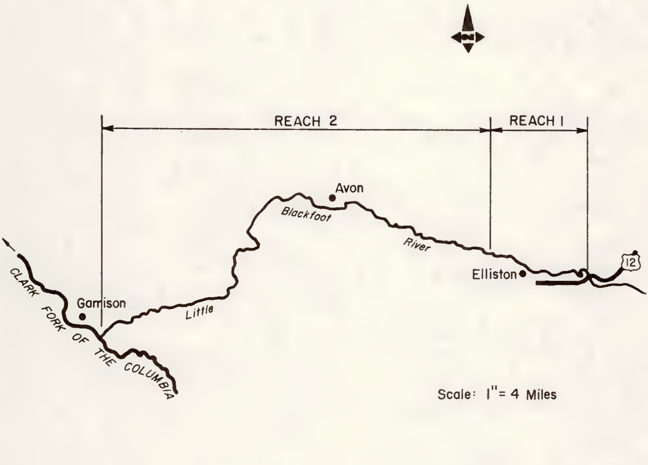
Figure 1
LITTLE BLACKFOOT RIVER
Reach Division and Location Map
Montana



INTRODUCTION

The Deer Lodge Valley Conservation District foresaw the need for baseline resource data to assist them in making management recommendations to landowners along the Little Blackfoot River. To achieve this, they requested a natural and physical features inventory of the river through the Soil Conservation Service, USDA, and the Montana Department of Fish, Wildlife and Parks.

The Little Blackfoot River originates below the Continental Divide approximately 15 miles west of Helena, Montana. Near Elliston the Little Blackfoot River flows through narrow mountain valleys. It is speculated that post timber harvest practices may have changed the seasonal discharge pattern of the watershed, but heavily vegetated banks and a cobble-boulder substrate have maintained a stable stream channel. Downstream from Elliston, man has altered the stream channel for a variety of reasons that include construction of a railroad and highway, flood control, and agriculture. These channel changes have altered the hydraulics of the stream and resulted in increased erosion and bedload movement. Poor land use practices and several recent high spring floods have aggravated the problem so that much of the lower river is in unstable condition.

Solving resource problems in the Little Blackfoot River corridor can be accomplished only through the cooperation of landowners along the river and with the assistance of such resource specialists as conservationists, fishery biologists, engineers, and conservation district supervisors.

Because of the dynamics of river systems, inventories should be updated periodically. The purpose should be to determine further needs and to recognize accomplishments.

SETTING

The Little Blackfoot River inventory began where U.S. Highway 12 crosses the river east of Elliston and continued for approximately 26 miles downstream to its confluence with the Clark Fork of the Columbia River in the vicinity of Garrison, Montana.

The Cliff Mountain area is the upper watershed for this river system. Vegetation types within the watershed vary from forestland and hayland to pastureland and riparian bottoms along the river course.

Riparian vegetation consists of mixed stands of cottonwood-Douglas-fir[1] overstory with an understory of willow, redosier dogwood, water birch, serviceberry, rose, grasses, and forbs. Land uses adjacent to the river include livestock grazing, agriculture, and a small amount of urban development near townsites.

Wildlife of the stream corridor includes white-tailed deer, black bear, ruffed grouse, mink, muskrat, raptors, and a variety of small mammals, songbirds, and waterfowl. Among the game fishes of the Little Blackfoot River are mountain whitefish and a variety of trout--rainbow, brook, and brown. Longnose suckers and sculpin are also inhabitants of the river. Residents of the Helena and Deer Lodge Valleys fish the river heavily. From a statewide fishing survey in 1975-76, the Department of Fish, Wildlife and Parks estimated that the lower section of the river provided an estimated 4,530 man-days of fishing. Fishermen log returns indicate that catch rates are generally very good, averaging 1.8 to 5.1 trout per hour over the last 15 years.

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[1]Common and scientific names for all plants and animals mentioned in this report are given in Appendix A.

The Montana Stream Evaluation Map recently prepared by the Department of Fish, Wildlife and Parks and the Fish and Wildlife Service rates the Little Blackfoot River as a value Class III--substantial fishery resource.

Climate within the inventory area varies with elevation. For example, the frost-free period ranges from about 50 days at Elliston, elevation of about 5,040 feet, to 90 days at Garrison, elevation of 4,350 feet. The average annual precipitation at Elliston and Garrison is 16 and 11 inches, respectively.

The U.S. Geological Survey's one streamflow gauge on the Little Blackfoot River is 4 miles east of Garrison near the mouth of the river. Since the installation of the gauge in October of 1972, the recorded maximum discharge was approximately 9,000 cubic feet per second (cfs) on May 22, 1981. Prior to this event, the maximum discharge was 3,650 cfs recorded on June 19, 1975. The minimum discharge was 6 cfs on August 24, 1977. The average discharge for 8 years of record is 176 cfs. The average discharge during the inventory period, June 19, 20, and 21, 1979, was 229, 229, and 208 cfs, respectively.

The Little Blackfoot River is classified as a B-1 stream according to the Montana Department of Health and Environmental Sciences water quality standards. Waters classified B-1 are suitable for drinking, culinary, and food processing purposes after conventional treatment; bathing and swimming recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl, and furbearers; and agriculture and industrial water supply. The river contributes about one-third to one-fourth of the average flow of the Clark Fork River near Garrison and provides enough high quality water to change the Clark Fork's designation from C-1 (not suitable for drinking) to B-1.

The Little Blackfoot River is a meandering stream with a gradient of 0.52 percent (0.52-foot drop in elevation per 100 feet of stream length). Total channel length inventoried is 139,745 feet (26.5 miles), and the total streambank length (left and right banks) is 279,490 feet.

METHODS AND PROCEDURES

The field inventory of the Little Blackfoot River was conducted by Jim Vashro, fishery biologist, Montana Department of Fish, Wildlife and Parks, and the author, Thomas J. Ganser, on June 19, 20, and 21, 1979.

The inventory was conducted by floating sections of the river with a canoe and walking other sections. Field observations were recorded on indexed aerial photographs of the river corridor. Large-scale (1"=200') photographs of the stream corridor were taken on December 12, 1975. Following field work, features identified during the inventory were permanently marked on the aerial photographs for future reference.

Aerial photographs, field sheets, and symbol legends for the Little Blackfoot River Inventory are filed at the Soil Conservation Service office at Deer Lodge, Montana.

Measurements for the selected parameters were determined directly from aerial photographs and then compiled by stream reaches for analysis. Data from each reach were then added to obtain the total for the entire river.

The Little Blackfoot River was divided into two reaches because of morphological and historical management differences. Reach I began where U.S. Highway 12 crosses the Little Blackfoot River east of Elliston and extended

4.3 miles downstream. Reach II began at the end of Reach I and ended 22.2 miles downstream at the confluence of the Little Blackfoot and the Clark Fork of the Columbia Rivers (Fig. 1).

Physical features selected for evaluation indicate the degree of stream stability, quality of fish and aquatic insect habitat, and levels of human activity and use of the river corridor.

Physical features recorded on aerial photos during the inventory included:

1. Visible man-caused channel alterations

2. Streambank alterations:

    a. rock riprap
    b. jetties
    c. car bodies
    d. river gravel
    e. dikes

3. Eroding banks

4. Critical sediment sources

5. Streambank vegetation:

    a. woody (trees and shrubs)
    b. herbaceous (forbs and grasses)

6. Streambed materials

7. Pools and riffles

8. Irrigation diversions

9. Log jams

10. Trash

Channel alterations include the straightening of gentle meanders or cutting through meander curves with a new channel of less distance than the original.

Streambank alterations include structural practices (rock riprap) used in an attempt to stabilize the streambank.

The difference between eroding banks and critical sediment sources is the rate of erosion that is occurring. Critical sediment sources are often associated with mass wasting of streambanks, a more accelerated form of erosion.

Woody vegetation provides a greater degree of streambank stability than does herbaceous vegetation. Where an overstory of mature trees occurs over a herbaceous understory, the herbaceous vegetation will generally dominate the site following the death of the trees. Excessive grazing by livestock contributes to this situation through the reduction or elimination of shrubby plant materials.

Streambed material was classed into the following groups:

Class	Diameter (inches)
Rubble/Boulder	3 - >8
Gravel/Rubble	0.1 - 8
Sand or silt	<0.1
Mixed	composed of sand/silt, plus one or more of the other types

Pools and riffles were identified by flow and depth of water. Pools are characterized by deep, quiet water. Riffles are shallow, fast-moving water where the surface is turbulent and broken. In this inventory, runs are a component of the term "pool." Runs are moderately fast-moving water with the surface not turbulent to the extent of being broken; they are intermediate between pools and riffles.

The ratio of pool length to riffle length (pool/riffle ratio) is one

indicator of the quality of a stream to support fish. Pools provide security areas for trout, and riffles provide spawning areas and habitat for aquatic invertebrate production.

Trash included any unnatural objects (excluding car bodies) placed in the river system--such as tires and household garbage.

FINDINGS

Reach I is characterized by a steep gradient, clear water, rubble/boulder bed material and a border of woody vegetation on 95 percent of the streambank. Reach I has a gradient of 0.53 percent. The pool/riffle ratio is 0.4 to 1. Only 1.5 percent of the streambanks are eroding, and 260 feet or 0.6 percent would be considered as critical sediment sources. Streambank alterations have occurred on 0.7 percent or 330 feet. There have been no channel alterations performed in this reach. Streambank and channel stability of this reach is considered excellent.

Reach II is also characterized by a steep gradient (0.52 percent); however, the similarities end there. Although the water is not turbid, a tremendous bedload is moving through this reach. Bed materials consist of rubble, gravel, sand, and silt. Woody vegetation exists on 70 percent of the streambanks. Streambank erosion is occurring on 11.6 percent of the reach. Sixty-one percent of the eroding banks (7.1 percent of total banks) is considered as critical sediment sources. Streambank alterations have occurred on 21.2 percent of the streambanks in the reach. Twenty-three percent (27,175 feet) of this channel reach has been altered. The pool/riffle ratio is 0.3 to 1. Streambank and channel stability of this reach is considered poor.

Inventory data for the two designated reaches are compiled in Table 1.

CONCLUSIONS AND RECOMMENDATIONS

Efforts on the Little Blackfoot River should be directed toward solving man-caused or aggravated erosion problems. The identified critical sediment sources, eroding banks and channel alterations, should be examined more closely and the necessary treatment determined. The correction of these problem areas will usually require management plans offering both structural and vegetative treatments.

To reach an acceptable degree of stream stability on the Little Blackfoot River, several aspects of stream management must be considered. Channel alterations have been used in the river in an attempt to control channel movement; these alterations have generally had a negative effect on stability of the river. A river produces a meandering pattern to expend its energy naturally in the system. Straightening a channel increases gradient and velocities that often translates into headcutting, bedload movement, streambank erosion, and deposition of materials downstream from the action.

In many cases, structural practices to stabilize critical eroding areas have been short-term. The most common example is excavating stream bottom materials to form dikes or to cover eroding banks in an attempt to protect them. These methods are considered short-term because spring runoff quickly erodes these materials back into the stream. Besides its temporary nature, this kind of treatment loosens the remaining streambed materials, often causing them to move downstream.

In reach I there is a high degree of stability even though the gradient and pool/riffle ratio are similar to reach II, which is not stable. This

is because reach I has 95 percent of its streambanks in woody vegetation, and streambed materials are of a large size. These two factors, combined with an unaltered channel, indicate not only a stable stream but more likely a natural one.

In reach II, 23 percent of the channel has been altered. Streambed material size class is smaller and there is less woody vegetation on streambanks than in reach I. These factors have contributed to a decreased pool/riffle ratio and an increase in stream gradient and water velocity. The result is instability of streambanks and headcutting of the stream channel.

An estimate of the expected stream gradient under stable conditions, with the streambed material found in reach II, would be 0.27 to 0.37 percent and a pool/riffle ratio of approximately 1.2 to 1. In comparison, the present gradient is 0.52 percent, and the pool/riffle ratio is 0.3 to 1.

Ten recommendations were developed for managing the Little Blackfoot River corridor:

1. Refrain from any further channel alteration work.

2. Where critical eroding banks exist, stabilize with blanket rock riprap and/or vegetative plantings. Do so in consultation with experienced resource conservationist, engineers, fishery biologist, and the Deer Lodge Valley Conservation District.

3. Where riparian zones will be grazed, management plans should be developed that recognize the value riparian vegetation has in providing streambank stability and fish and wildlife habitat.

4. Livestock watering sites should be developed away from the river for livestock safety and streambank protection. Where this is not possible, specific livestock watering sites should be developed along the river to replace free access to entire stream reaches.

5. Where natural streambank vegetation has been removed or destroyed, it should be replaced with a combination of native woody and herbaceous plant materials wherever possible.

6. Montana law forbids the use of car bodies as riprap. Many of the car bodies observed should be removed from the channel and properly disposed of.

7. Some log jams will need to be removed to prevent damage to streambanks. This decision should be made on a case-by-case basis. If removal is desirable, it should be done in such a manner than equipment does not enter the stream.

8. Temporary diversions made of rock and river gravel should be replaced with permanent irrigation diversions. Where practical, drop structures should be incorporated into these diversions to assist in stabilizing stream gradient.

9. All trash should be removed from the river for esthetic reasons and to eliminate flow impediment.

10. Careful management should be exercised in the upper watershed so that logging does not increase peak spring flows in the river.

Solving problems of the Little Blackfoot River will take a concerted effort on the part of all landowners along the river. The other necessary elements for success will be financial support, time, and patience.

TABLE 1--LITTLE BLACKFOOT RIVER INVENTORY DATA

Physical Features	Reach I	Reach II	Total	Percentage of Total
Length, ft. (mi.)	22,675 (4.3)	117,070 (22.2)	139,745 (26.5)	
Gradient (%)	0.53	0.52	0.52	
Channel alterations, ft.	0 (0)	27,175 (23.2)	27,175	19.5
Streambank alterations:				
Rock riprap, ft.	70 (0.2)	18,900 (8.1)	18,970	6.8 }
Jetties, number	2	0	2	} 17.9%
Car bodies, number	4	18	22	} stream-
Car bodies as riprap, ft.	0	0	0	} bank
River gravel, ft.	80 (0.2)	10,005 (4.3)	10,085	3.6 } altered
Dikes, ft.	180 (0.4)	20,730 (8.9)	20,910	7.5 }
Eroding banks, ft.				
Left bank	50	11,760	11,810	
Right bank	620	15,380	16,000	
Both banks (%)	670 (1.5)	27,140 (11.6)	27,810	10.0
Critical sediment sources, ft.				
Left bank	0	7,130	7,130	
Right bank	260	9,400	9,660	
Both banks (%)	260 (0.6)	16,530 (7.1)	16,790	6.0
Streambank vegetation, ft.				
Woody:				
Left bank	22,075	82,325	104,400	
Right bank	20,840	81,695	102,535	
Both banks (%)	42,915 (95)	164,020 (70)	206,935	74.0
Herbaceous:				
Left bank	600	34,745	35,345	
Right bank	1,835	35,375	37,210	
Both banks	2,435 (5)	70,120 (30)	72,555	26.0
Stream bottom material, ft. (%)				
Rubble/boulder	18,945 (84)	1,600 (1.2)	20,545	14.7
Rubble/gravel	3,730 (16)	106,435 (91)	110,165	78.8
Sand/silt	0	0	0	0
Mixed	0	9,035 (7.8)	9,035	6.5
Pools and riffles				
Pool length, ft.	6,715	26,040	32,755	
Riffle length, ft.	15,960	91,030	106,990	
Pool/riffle ratio	0.4/1	0.3/1	0.31/1	
Irrigation diversions, number	6	17	23	
Log jams, number	3	46	49	
Trash, sites	4	1	5	

APPENDIX A
Common and Scientific Names

Plants

Cottonwood	*Populus* spp.
Douglas-fir	*Pseudotsuga menziesii*
Willow	*Salix* spp.
Redosier dogwood	*Cornus stolonifera*
Water birch	*Betula occidentalis*
Serviceberry	*Amelanchier alnifolia*
Rose	*Rosa* spp.

Mammals

White-tailed deer	*Odocoileus virginianus*
Black bear	*Ursus americanus*
Mink	*Mustela vison*
Muskrat	*Ondatra zibethica*

Birds

Ruffed grouse	*Bonasa umbellus*

Fishes

Rainbow trout	*Salmo gairdneri*
Brook trout	*Salvelinus fontinalis*
Brown trout	*Salmo trutta*
Mountain whitefish	*Prosopium williamsoni*
Longnose sucker	*Catostomus catostomus*
Sculpin	*Cottus* spp.